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EXAMINER	
LANDAU, MATTHEW C	
ART UNIT	**PAPER NUMBER**
2815	

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Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No.	Applicant(s)	
	10/765,301	LESLIE, TERRENCE C.	
	Examiner	Art Unit	
	Matthew Landau	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) *5-7,21-23,28 and 29* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,8-20,24-27 and 30-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/17/04, 5/26/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of Species I in the reply filed on September 23, 2005 is acknowledged.

Applicant indicated that claims 1-4, 8-16, 19, 20, 22, 26, 27, and 30-40 read on the elected species. After a review of the figures, it is clear that claims 17, 18, 24, and 25 also read on the elected species, but claim 22 does not. Therefore, claims 5-7, 21-23, 28, and 29 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 8, the limitation "wherein the access device is free from a shallow trench isolation layer" renders the claim indefinite. It is unclear what structure Applicant intends to claim by using this limitation. An isolation structure would never be considered part of an access device, therefore it is unclear what is meant by having an access device that is free from a shallow trench isolation layer.

Claim Objections

Claims 11, 16, and 26 are objected to because of the following informalities:

Regarding claim 11, it is suggested the limitations "first source/drain" and "second source/drain" be changed to "first source/drain region" and "second source/drain region" to be consistent with the claims depending therefrom.

Regarding claims 16 and 26, the limitation "in electrically communication" should be changed to "in electrical ~~electrically~~ communication".

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 8-11, 13-18, 20, and 25-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Fitch et al. (US Pat. 5,451,538, hereinafter Fitch).

Regarding claims 1, 2, 9, 11, 16, and 26, Figure 10 of Fitch discloses a substrate 12/14; an electrical signal line (word line) 18 on the substrate (col. 7, lines 45 and 46); an access device including a selective epitaxy mesa (layers 28, 30, 32, and 34) formed on and extending outwardly from the substrate, the mesa including first (bottom) source/drain region 28 adjacent the substrate and in electrically communication with the signal line, a second (top) source/drain region 32/34, a body (channel) 30 extending vertically between the first source/drain region and the second source/drain region, an insulator 22 on the body, and a gate 18 on the insulator; and a storage device (capacitor) 69 on the mesa remote from the substrate. Note that Figure 4 of Fitch discloses that layers 28, 30, 32, and 34 are selectively formed by epitaxial growth techniques (col. 4, lines 30-36). Also note the electric field generated by the gate controls the flow of current between the source and drain. Therefore, it can be considered that the gate (word line) is in "electrical communication" with the source/drain region. Applicant has not defined the phrase "electrical communication" in a manner that would preclude this interpretation. Further regarding claim 11, Figure 4 of Fitch discloses the first and second source/drain regions (28 and 32/34, respectively) are each a selective epitaxy doped region of the selective epitaxy mesa (col. 4, lines 43-48 and col. 5, lines 3-10).

Regarding claim 3, Fitch discloses the bottom source/drain region 28 is an in situ doped region (col. 4, lines 43-48).

Regarding claim 4, Fitch discloses the top source/drain region 32/34 is an in situ doped region (col. 5, lines 3-10).

Regarding claim 8, Figure 10 of Fitch discloses the access device is free from a shallow trench isolation layer.

Regarding claim 10, Fitch discloses the substrate 12 includes silicon (col. 3, line 10), and wherein the selective epitaxy mesa includes silicon (col. 4, lines 36-41).

Regarding claim 13, Figure 10 of Fitch discloses the first source/drain region 28 contacts a bit line 14 (col. 7, lines 46 and 47).

Regarding claim 14, Figure 10 of Fitch discloses the second source/drain region 32/34 is spaced from the substrate 12 by the body 30.

Regarding claim 15, Fitch discloses the first source/drain region 28 is an in-situ doped region of the mesa (col. 4, lines 52-55).

Regarding claim 17, Figure 10 of Fitch discloses the electrical signal line 18 has a first height, and wherein the first source/drain region 28 has a second height less than the first height.

Regarding claim 18, Figure 10 of Fitch discloses the mesa cantilevers upwardly form the substrate 12, and wherein the epitaxy mesa includes an end, remote from the substrate, forming a second source/drain region 32/34.

Regarding claim 20, Figures 6 and 10 of Fitch disclose the electrical signal line 18 extends around the first source/drain region 28.

Regarding claim 25, Figure 10 of Fitch discloses the second source/drain region 32/34 is connected to the storage device 69.

Regarding claim 27, Figure 10 of Fitch discloses the gate 18 surrounds the body 30, and wherein the gate surrounds the insulator 22 such that the gate effects electrical conductivity of the body from more than one angle.

Claims 1-4, 8-20, and 24-27 are rejected under 35 U.S.C. 102(e) as being anticipated by Bissey et al. (US Pat. 6,794,699, hereinafter Bissey).

Regarding claims 1 and 2, Figures 4, 5, and 10 of Bissey disclose a memory cell, comprising: a vertical access device including a mesa; and a storage device (capacitor) 50/52/54 on the mesa. The vertical access device includes a bottom source/drain region 38, a conductive body region (channel) 33, and a top source/drain region 48. Note that the limitation "selective epitaxy" is merely a product-by-process limitation. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966. Note that epitaxy refers to a particular method of growing crystalline layers. An epitaxial layer is merely a layer that mimics the crystal orientation of the substrate. Since the pillars 33 are formed from the substrate, they inherently have the same crystal orientation of the substrate. Therefore, the product-by-process limitation "selective epitaxy" does not structurally distinguish the claimed invention over Bissey.

Regarding claims 3 and 4, the limitations "wherein the bottom source/drain is an in situ doped region" and "wherein the top source/drain is an in situ doped region" are merely product-by-process limitations that do not structurally distinguish the claimed invention over the prior art. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is

unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966.

Regarding claim 8, Figure 10 of Bissey discloses the access device is free from a shallow trench isolation layer.

Regarding claims 9, 16, and 26, Figures 2-10 of Bissey disclose a substrate 32; an electrical signal line 36 on the substrate; an access device including a mesa formed on and extending outwardly from the substrate, the mesa including first source/drain region 38 adjacent the substrate and in electrically communication with the signal line, the mesa further including a body 33 extending vertically from the first source/drain region, an insulator 42 on the body, and a gate 44 on the insulator; and a storage device 52/50/54 on the mesa remote from the substrate. See the rejection of claim 1 above for specifics regarding the access device, and regarding the product-by-process limitation "selective epitaxy".

Regarding claim 10, Figure 10 of Bissey discloses the substrate and mesa includes silicon (col. 3, line 65 – col. 4, line 3).

Regarding claim 11, Figures 9 and 10 of Bissey disclose the access device includes a body 33, a first source/drain 38, a gate 44 and a second source/drain 48, wherein the body extends between the first source/drain and the second source/drain, and wherein the first source/drain and the second source/drain are each a doped region of the mesa.

Regarding claim 12, Figures 4, 5, and 10 of Bissey disclose the first source/drain region 38 extends horizontally around the mesa.

Regarding claim 13, Figure 10 of Bissey discloses the first source/drain region 38 contacts a bit line 36.

Regarding claim 14, Figure 10 of Bissey discloses the second source/drain region 48 is spaced from the substrate by the body 33.

Regarding claim 15, Figure 10 of Bissey discloses the first source/drain region 38 is an N+ doped region of the mesa. See the rejections of claim 1 and 3 regarding the product-by-process limitations "in-situ" and "selective epitaxy".

Regarding claim 17, Figure 10 of Bissey discloses the electrical signal line 36 has a first height, and wherein the first source/drain region 38 has a second height equal to or less than the first height.

Regarding claim 18, Figure 10 of Bissey discloses the mesa cantilevers upwardly from the substrate 32, and wherein the mesa includes an end remote from the substrate, forming a second source/drain region 48.

Regarding claims 19 and 20, Figures 4 and 5 of Bissey disclose the first source/drain region 38 extends around an outer periphery of the mesa, and wherein the electrical signal line 36 extends around the first source/drain region 38.

Regarding claim 24, Figures 10 of Bissey discloses the first source/drain region is connected to the a buried bit line 36. Figure 1 of Bissey discloses the bit line (BL) is connected to a column address decoder.

Regarding claim 25, Figure 10 of Bissey discloses the second source/drain region 48 is connected to the storage device 50/52/54.

Regarding claim 27, Figures 8, 9, and 10 of Bissey disclose the insulator 42 surrounds the body 33, and wherein the gate 44 surrounds the insulator such that the gate effects electrical conductivity of the body from more than one angle.

Claims 31-37 are rejected under 35 U.S.C. 102(b) as being anticipated by Augusto (US Pat. 5,963,800).

Regarding claims 31 and 32, Figure 2a of Augusto discloses a vertical transistor comprising: a vertical, epitaxy body 1/3/5/7 extending from a horizontal substrate 9; a first doped region 7 in the body adjacent the substrate; a second doped region 1 in the body remote from the substrate; an undoped intermediate region (channel) 3 between the first doped region and the second doped region; and a gate 13 surrounding the intermediate region (col. 10, lines 36-40). Note that Augusto discloses the semiconductor layers are formed by epitaxial growth (col. 10, lines 16-20). The limitation "selective epitaxy" is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966.

Regarding claims 33 and 34, Figure 12.5 of Augusto discloses the first doped region (source) is adapted to be in electrical communication with a buried bit line, while the gate is adapted to be in electrical communication with a wordline.

Regarding claims 35-37, Figure 2a of Augusto disclose the gate 13 overlies about all of the surface area of the intermediate region 3 (since the gate surrounds the intermediate region as indicated in the rejection of claim 31).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fitch in view of Kurjanowicz et al. (US PGPub 2002/0131291, hereinafter Kur).

Regarding claim 30, Fitch discloses the electrical signal line (word line) 18 is made of polysilicon (col. 3, lines 15-18). The difference between Fitch and the claimed invention is the signal line includes titanium. Kur discloses using titanium silicided wordlines (paragraph [0006], last 5 lines). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Fitch by included a layer of titanium silicide on the signal line for the purpose of reducing the effective resistance (see last 5 lines in paragraph [0006] of Kur).

Claims 38-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Augusto in view of Fitch.

Regarding claims 38-40, Augusto does not specifically disclose the vertical, epitaxy body is generally cylindrical, the gate is generally annular and extends completely around the body, and the first doped region is cylindrical. Figures 4 and 6 of Fitch disclose a vertical, epitaxy

cylindrical body, a cylindrical source/drain region 28, and a gate 18 that is generally annular and extends completely around the body. Note that it considered that the gate is only the portion of layer 18 that is in the immediate vicinity of the channel (therefore having an annular structure). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Augusto by using the cylindrical configuration of Fitch for the purpose of obtaining a maximum amount of current carrying capability (col. 6, lines 20-25 of Fitch).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is (571) 272-1731.

The examiner can normally be reached from 8:30 AM - 5:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone numbers for the organization where this application or proceeding is assigned are (571) 273-8300 for regular communications and (571) 273-8300 for After Final communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should any questions arise regarding access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew C. Landau

November 9, 2005